

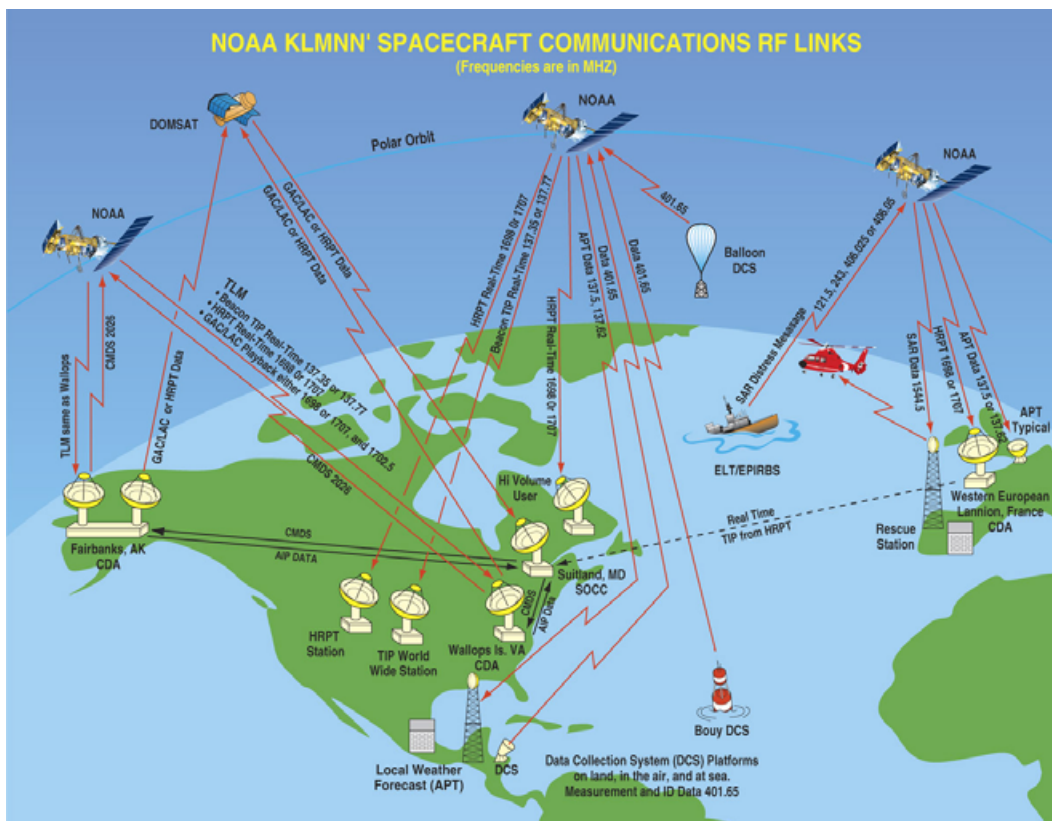
SPACECRAFT DATA COMMUNICATIONS

The spacecraft transmits instrument data to the ground for three primary functions: Command and Data Acquisition (CDA), Direct Broadcast, and Search and Rescue.

COMMAND AND DATA ACQUISITION (CDA) STATION DOWNLINKS

CDA stations located at Fairbanks, Alaska, and Wallops Island, Virginia, receive stored Global Area Coverage (GAC) and Local Area Coverage (LAC) data from each spacecraft. The CDAs can also receive real-time data when the satellites are within the direct readout footprint.

GAC data is recorded and contains satellite housekeeping information, AMSU data, and 4-km (2.5-mi) resolution AVHRR imagery. GAC data contains over 100



NOAA KLMNN' Spacecraft Communications RF Links (Frequencies are in MHz)

minutes of imagery and is transmitted to a NOAA ground CDA station for relay to centralized viewers.

LAC data is recorded information that contains 1-km (0.6-mi) AVHRR imagery. LAC data is recorded for up to 10 minutes and transmitted to a NOAA ground CDA station for relay to centralized users.

High Resolution Picture Transmission (HRPT) is a real-time transmission of instrument data and satellite housekeeping data. CDA stations intercept HRPT data primarily for satellite housekeeping data, but also relay the higher resolution data to centralized users.

DIRECT BROADCAST DOWNLINKS

For more than 30 years, NOAA has freely and openly provided satellite data through direct broadcast to users in the United States and in 100 other countries throughout the world. In the United States, any commercial firm receiving data through direct readout may provide tailored products to customers and/or viewers.

There are three types of direct broadcasting: (1) the real-time HRPT, (2) the direct sounder broadcast (DSB), also referred to as the real-time very high frequency (VHF) beacon transmissions, and (3) the Automatic Picture Transmission (APT).

High Resolution Picture Transmission (HRPT)

HRPT provides worldwide direct readout of full resolution spacecraft parameters and instrument data to ground stations within the footprint of the NOAA polar orbiters. The HRPT service was originally designed to provide timely day and night sea surface temperature, ice, snow, and cloud cover information to diverse users, but applications have expanded due to the proliferation of moderately priced equipment and software. HRPT transmissions contain data from all instruments aboard the NOAA polar satellites. The data stream includes information from the TIROS Information Processor (TIP), the AMSU Instrument Processor (AIP) and from the AVHRR/3 providing five of six channels at 1-km (0.62-mi) resolution. The TIP contains spacecraft attitude data, time codes, housekeeping, and low rate instrument science data from the HIRS/3, SEM/2, DCS/2 and the SBUV. The AMSU-A and AMSU-B are also included in HRPT from the (AIP).

To receive the data, users can purchase the necessary equipment (computer, software, antenna) from commercial companies for unlimited access to the HRPT

signals. In 2000, there were 628 HRPT receivers worldwide registered with the World Meteorological Organization (WMO).

Direct Sounder Broadcasting (DSB)

VHF beacon transmission is available to users who do not intend to install the more complex equipment necessary to receive high data rate S-band service. The lower data rate from the TIP permits the user to install less complex, less costly equipment to receive the data (HIRS/3, SEM/2, DCS/2, but not AMSU).

Parallel outputs are provided for the DSB real-time VHF beacon transmission and for the Manipulated Information Rate Processor (MIRP) HRPT S-band links. The instrument data is multiplexed with analog and digital housekeeping data. The TIP output directly modulates the beacon transmission. The data is transmitted as an 8.32 kbps split phase signal over one of the beacon transmitters at 137.35 MHz and 137.77 MHz.

Automated Picture Transmission (APT) Data

APT is smoothed 4-km (2.5 mi) resolution IR and visible imagery derived from the AVHRR/3 instrument and transmitted within the footprint of the NOAA polar orbiters. Since APT is captured on low-cost VHF ground stations, it is also very popular in schools. Users purchase the necessary equipment (computer, software, antenna) from commercial companies for unlimited access to APT signals. In 2000, there were 4,907 APT receivers worldwide registered with the WMO.

The Satellite Operations Control Center (SOCC) can program any two of the active five AVHRR channels provided to the MIRP can be selected and processed as “Video A” and “Video B.” One APT line, consisting of one line of Video A and one line of Video B, is output every third AVHRR scan. Ancillary AVHRR data appears at one edge of each line and their 64-second repetition period defines the APT frame length. The resulting line rate is two per second. The data is transmitted continuously over a dedicated VHF link as an analog signal consisting of an amplitude-modulated 2400-Hz subcarrier frequency modulating the RF carrier at 137.50 MHz or 137.62 MHz

SEARCH AND RESCUE DOWNLINKS

For information about SAR, please refer to the previous section titled *Search and Rescue Instruments* that begins on page NOAA-M/8.